

A Digenetic Trematode, *Parahaplometroides basiliscae*
Thatcher, 1963, from the Mouth of the Crested Lizard,
*Basiliscus basiliscus*¹

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(Plates I & II)

INTRODUCTION

A SPECIMEN of *Basiliscus basiliscus*, from an unknown locality in South America, purchased from a commercial dealer, was received at the New York Zoological Park on June 24, 1965, and died December 23, 1965. At autopsy, 18 trematodes were found in the mouth, firmly attached to the mucosa. While at the Zoo, the animal had been fed sporadically on crickets, but no other food was provided. Accordingly, it is probable that the trematode parasites were acquired before arrival at the Zoo and presumably while in the wild. The worms are similar to and probably identical with specimens from *Basiliscus vittatus*, described by Thatcher (1963) as *Parahaplometroides basiliscae* n. g., n. sp. The specimens of Thatcher are larger and more extended, and their organs are correspondingly larger. The differences, however, are not great and the present specimens may be smaller as a result of development in a different host or because the animal may have suffered impaired nutrition as a result of captivity. Accordingly, they are assigned tentatively to the species *P. basiliscae*. Representative specimens are deposited in the Helminthological Collection of the U. S. National Museum under the number 61,159.

These lizards inhabit an area from northern South America to tropical Mexico. They are active arboreal animals that live along the banks of rivers. Although usually regarded as herbi-

vorous, Ditmars (1933) reported that in captivity they preferred meal worms and caterpillars to berries.

The worms (Fig. 1) were fixed without flattening and preserved in formalin. Specimens stained with paracarmine and others with haematoxylin were prepared as whole mounts and others were sectioned serially in transverse or frontal planes. The sections were stained with haematoxylin and erythrosin.

DESCRIPTION

All of the specimens are gravid; they are ovate to pyriform in outline, only slightly flattened, and with the preacetabular region narrowed and curved ventrad. They measure from 4 to 6 mm. long, 1.3 to 2.5 mm. wide and 0.8 to 1.2 mm. thick. The cuticula is armed with sharp, thickly-set spines, 0.030 to 0.032 mm. in length and 0.007 mm. wide at the base, which are reduced posteriorly and may be absent in the posttesticular area. The cuticula consists of two distinct layers (Fig. 3), an outer opaque rugose, amorphous stratum, 0.015 mm. in thickness, which stains with haematoxylin, and an inner, clear, prismatic layer of similar thickness, in which the lines are at right angles to the surface, and which appears pinkish in erythrosin-stained sections. The spines are set in pits on the external surface of the inner layer.

The acetabulum is situated in the anterior part of the middle third of the body and measures 0.60 to 0.65 mm. in diameter. The body-wall consists of well-developed circular, longitudinal and oblique layers of muscles and the parenchyma is relatively compact. The mouth is sub-terminal, the oral sucker approximately the same size as the acetabulum. There is a short pre-

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pharynx; the pharynx is spherical to cylindrical, 0.35 to 0.38 mm. long, 0.3 to 0.34 mm. wide, with peri-pharyngeal glandular cells. The esophagus is about as long as the pharynx and, with its bifid posterior end, is lined with longitudinal cuticular ribs. The ceca extend posteriorly, parallel to and near the lateral edges of the body. They are lined with high columnar epithelium and terminate near the posterior end of the body. The excretory pore is terminal; excretory ducts appear in sections but the pattern was not worked out.

The testes are situated diagonally in the posterior half of the body. They are almost spherical, 0.52 to 0.85 mm. in diameter, often longer in the dorsoventral axis. The posterior testis is on the left and the anterior testis on the right side of the body; fields and zones may overlap or be distinct. Sperm ducts arise from the anterodorsal margins of the testes and pass forward, converging and uniting as they enter the cirrus sac, dorsal to the acetabulum. The common sperm duct, after it enters the cirrus sac, expands to form a much coiled seminal vesicle, enclosed in prostatic cells, which occupies the posterior half of the cirrus sac. From the seminal vesicle, a short duct leads to the thick-walled, cylindrical, muscular cirrus, which is protusible and when retracted measures 0.26 to 0.38 mm. long and 0.15 to 0.22 mm. wide. The cirrus sac is 0.80 to 1.25 mm. in length and 0.35 to 0.40 mm. in diameter. It is clavate, wider posteriorly, and curves diagonally forward, dextrad and ventrad to open into the common genital atrium (Fig. 2), situated in the extracecal area of the right side, at the level of the bifurcation of the alimentary tract. The cuticula of the cirrus is not spined.

The ovary is spherical to oval, situated on the left side, near the dorsal surface, immediately posterior to the cirrus sac, and partially overlapping the acetabulum. It is 0.32 to 0.51 mm. in diameter, longest in the dorso-ventral axis. The oviduct arises at the dorsomedian-posterior face and passes medially where it receives a short duct from the seminal receptacle, an oval structure 0.018 to 0.020 mm. in length and 0.007 to 0.015 mm. in width. The seminal receptacle is dorsal and slightly posterior to Mehlis' gland. Immediately after receiving the duct from the seminal receptacle, Laurer's canal branches from the oviduct and coils dorsally to open at the surface of the body. After the emergence of Laurer's canal, the oviduct receives the duct from the vitelline receptacle and, following a strong sphincter, it expands to form the ootype. All the structures of the area are enclosed in the cells of Mehlis' gland. The initial coils of the

uterus are ventral and anterior to the ootype; they contain young, thin-shelled eggs, embedded in masses of spermatozoa. The uterus then passes posteriorly and, as the descending limb, extends in loops and coils on the dorsal side to the posterior end of the body. The ascending limb courses forward in a similar manner on the ventral side of the body to the level of the acetabulum, where it turns dorsad and unites with the muscular metraterm. At the level of the anterior testis, the uterine coils are displaced to the left side of the body and at the level of the posterior testis the uterine coils are displaced to the right side. The descending limb contains young eggs with thin shells, whereas in the pretesticular area, the ascending limb contains dark-colored, thick-shelled eggs. The posttesticular region is filled with uterine coils but here the egg-shells are thin, usually collapsed, and so similar in appearance that the descending and ascending limbs cannot be clearly distinguished. The ascending limb opens into the metraterm at the level of the ovary and the metraterm and cirrus sac pass forward, the metraterm dorsally on the right and the cirrus sac ventrally on the left. Both open into a shallow atrium which is obliterated when the cirrus is protruded. The vitelline follicles are spherical to pyriform, 0.03 to 0.06 mm. in diameter; they are situated in the middle third of the body, extending lateral and dorsal to the digestive ceca from the level of the acetabulum to the level of the posterior testis. At the ovarian zone, the follicles extend more medially and just posterior to the ovary, ducts from right and left sides unite to form the vitelline receptacle, from which a duct passes forward and ventrad to open into the oviduct as previously noted. Mature, hard-shelled eggs are oval, 0.038 to 0.045 mm. long and 0.018 to 0.020 mm. wide. The eggs are slightly pointed at the opercular end and are "shouldered," *i.e.*, each has a thickened rim on the shell, into which the operculum fits. The eggs are embryonated when passed.

DISCUSSION

Thatcher (1963) compared *Parahaplometroides* with *Haplometroides* Odhner (1911), a genus erected to contain *H. buccicola*, from the mouth of *Elaps* sp. taken in Paraguay. A second species of *Haplometroides*, *H. rappia*, was described by Szidat (1932) from the mouth of *Rappia concolor* taken in Liberia. *Parahaplometroides* was assigned to the subfamily Styphlodorinae Dollfus, 1937, whereas Baer & Joyeux (1961) included *Haplometroides* in the subfamily Plagiorchiinae Pratt, 1902. The two genera differ in shape of body, length of ceca, and in the location of testes and genital pore, but Thatcher did not compare *Parahaplometroides* with other

similar and related genera. It resembles *Ochetosoma* Braun, 1901, and *Zeugorchis* Stafford, 1905, in extracecal position of the genital pore but differs from these genera in length of digestive caeca, position of testes, extent of vitellaria, and in the presence of a seminal receptacle. In many respects it is similar to *Lechriorchis* Stafford, 1905, and *Dasymetra* Nicoll, 1911, but in those genera the genital pore is intracecal, median or submedian, there is no seminal receptacle, and the vitellaria extend along the greater part of the caeca. It differs from *Styphlodora* Looss, 1899; *Astiotrema* Looss, 1900; *Glossidiella* Travassos, 1927; *Allopharynx* Strom, 1928; and *Paurophyllum* Byrd, Parker and Reiber, 1940, in situation of genital pore, position of testes, extent of vitellaria and in location in the host. *Microderma* Mehra, 1931, lacks Laurer's canal and seminal receptacle, while *Parallelopharynx* Caballero, 1946, differs in tandem arrangement of testes near the posterior end of the body, short metratrem, and extensive vitelline follicles. These and other related genera belong in the group of plagiorchiid trematodes of reptiles that have been included by different authors in the subfamilies Plagiorchinae Pratt, 1902, Astiotrematinae Baer, 1924, and Styphlodorinae Dollfus, 1937. The diagnostic characters of genera and subfamilies are uncertain and familial relations are disputed.

Historically, Pratt (1902) erected the subfamily Reniferinae to include *Renifer* Pratt, 1902, *Styphlodora* Looss, *Astiotrema* Looss, *Ochetosoma* Braun, and *Oistosomum* Odhner, 1902. Odhner (1911) raised Reniferinae to familial status and recognized that *Styphlodora*, *Pachysolus* Looss, 1901, and *Styphlotrema* Odhner, 1911, constitute a closely-related group. Baer (1924) divided the Reniferidae into three subfamilies: Reniferinae Pratt, Enodiotrematinae n. subf., and Styphlotrematinae n. subf. He distinguished between Reniferidae and Lepodermatidae and in the latter family recognized five subfamilies: Lepodermatinae Looss, 1899; Brachycoelinae Looss, 1899; and three new subfamilies: Astiotrematinae, Cymatocarpinae, and Saphekratrinae. Baer excluded *Styphlodora* and left it unplaced because of the aberrant type of excretory vesicle. Dollfus (1937) noted that *Styphlotrema*, not *Styphlodora*, has the atypical excretory vesicle and that the name of the subfamily is Styphlodorinae.

Lepoderma Looss, 1899, was suppressed as a synonym of *Plagiorchis* Lühe, 1899, by Braun (1901) and Ward (1917) changed the name of the family from Lepodermatidae to Plagiorchidae. Leão (1945) declared that *Renifer* is iden-

tical with *Ochetosoma* and he changed the names of the family and subfamily from Reniferidae and Reniferinae to Ochetosomatidae and Ochetosomatinae. Yamaguti (1958) rejected the Ochetosomatidae and Ochetosomatinae; instead he included *Ochetosoma* (syn. *Renifer* Pratt; *Neochetosoma* Nicoll, 1911, *lapsus* for *Neochetosoma* Caballero, 1949; *Heterocoelium* Travassos, 1921; *Pseudorenifer* Allison and Holl, 1937; and *Neorenifer* Byrd and Denton, 1938) in the subfamily Styphlodorinae, which with 18 other subfamilies were included in the family Plagiorchidae. The subfamily included: *Styphlodora* Looss (syn. *Platymetra* Mehra, 1931); *Dasymetra* Nicoll; *Eustomos* MacCallum, 1921; *Glossidioides* Yamaguti, 1958; *Glossidium* Looss, 1899; *Haplometroides* Odhner, 1911; *Lechriorchis* Stafford (syn. *Mediorima* Nicoll, 1914); *Leptophyllum* Cohn, 1902 (syn. *Travtrema* Pereira, 1929); *Ochetosoma* Braun; *Paralepoderma* Dollfus, 1950; *Paurophyllum* Byrd, Parker & Reiber, 1940; *Pneumatophilus* Odhner, 1911; *Styphlotrema* Odhner, and *Zeugorchis* Stafford, 1905 (syn. *Caudorchis* Talbot, 1933; *Plagitura* Holl, 1928, *partim*; *Paralechriorchis* Byrd & Denton, 1938).

Baer & Joyeux (1961) recognized the family Ochetosomatidae and included Ochetosomatinae and Styphlodorinae as two of six subfamilies. The subfamily Ochetosomatinae contained the genera *Ochetosoma* Braun (syn. *Heterocoelium* Travassos; *Neochetosoma* Caballero; *Neorenifer* Byrd and Denton; *Pseudorenifer* Allison and Holl; *Renifer* Pratt); *Pneumatophilus* Odhner; *Stomatotrema* Odhner, *lapsus* for *Stomatotrema* Guberlet, 1928; *Zeugorchis* Stafford (syn. *Caudorchis* Talbot; *Paralechriorchis* Byrd and Denton). The subfamily Styphlodorinae included: *Styphlodora* Looss (syn. *Paurophyllum* Byrd and Denton for *Paurophyllum* Byrd, Parker and Reiber, 1940; *Platymetra* Mehra, 1931); *Allopharynx* Strom (syn. *Megacustis* Bennett, *Ptyasorchis* for *Ptyasiorchis* Mehra); *Aptorchis* Nicoll; *Glossidiella* Travassos; *Glossidium* Looss (syn. *Glossidioides* Yamaguti); *Parallelopharynx* Caballero, and *Spinometra* Mehra (syn. *Glossimetra* Mehra).

In the arrangement of Yamaguti (1958), the genera *Allopharynx*, *Glossidiella*, *Parallelopharynx*, *Glossimetra*, and *Spinometra* were assigned with others to the subfamily Astiotrematinae Baer, 1924, in the family Plagiorchidae. Thus, the subfamily Astiotrematinae of Yamaguti is roughly comparable to the subfamily Styphlodorinae of Baer & Joyeux. In the system of Baer & Joyeux, the subfamily Astiotrematinae disappeared and *Astiotrema* and related genera were included in the subfamily Plagiorchinae, family

Plagiorchiidae. Whether or not the Plagiorchiidae and Ochetosomatidae are distinct families is debatable, since certain genera are assigned to one or the other. Even the genera are not clearly delimited; a number have been proposed and suppressed as identical, but the genus *Ochetosoma* as revised by Dubois & Mahon (1959) includes species with such diverse morphology that the unity and integrity of the genus is compromised.

The superfamily Plagiorchioidea Dollfus (1930) is a multitudinous and widely dispersed group with representatives in fishes, amphibians, reptiles, birds and mammals, where they occur in the digestive, excretory and respiratory organs. These parasites have undergone extensive modifications from their invasion of diverse hosts and varied locations, and evaluation of their taxonomic relations is very difficult. Yamaguti attempted to relate the parasitic groups with their hosts, without reference to superfamily, whereas Baer & Joyeux followed the outline of La Rue (1957) based on life-cycles and larval stages as well as morphology of mature specimens. In their arrangement, the Ochetosomatidae and Plagiorchiidae were adjacent families in the Plagiorchioidea, whereas Yamaguti merged them as a single unit.

SUMMARY

Digenetic trematodes from the mouth of the crested lizard, *Basiliscus basiliscus*, are described. Although somewhat smaller, they are assigned tentatively to the species *Parahaplometroides basiliscae* Thatcher, 1963. The worms manifest morphological similarity to *Styphlodora* Looss, 1899; *Ochetosoma* Braun, 1901, *Haplometroides* Odhner, 1911 and other genera of reptilian parasites, but the diagnostic features, taxonomic relations, and subfamilial assignments of these genera are uncertain. They were included in the family Plagiorchiidae Ward, 1917 by Yamaguti (1958), whereas certain of them were assigned to the family Ochetosomatidae Leão, 1945 by Baer and Joyeux (1961).

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EXPLANATION OF PLATES

PLATE I

- FIG. 1. *Parahaplometroides basiliscae*, whole mount, somewhat flattened, ventral view, showing gross morphology, suckers, digestive system, gonads, vitellaria, genital pore, cirrus sac, metraterm, and uterine coils which cover much of the ovary.

PLATE II

- FIG. 2. Oblique view, 1.20 mm. in diameter, resulting from ventral curvature of the forebody, through the genital pore, showing sections of the digestive ceca, the genital atrium and terminal portions of the cirrus sac and metraterm, and sections of excretory tubules in the lateral areas.

- FIG. 3. Oblique view, 1.0 mm. in diameter, from a different specimen, showing section of the esophagus and its connection with a digestive cecum, sections of the cirrus sac and metraterm, with excretory tubules in the lateral and ventrolateral areas.

ABBREVIATIONS

ac—acetabulum	ph—pharynx
cs—cirrus sac	os—oral sucker
es—esophagus	ov—ovary
dc—digestive cecum	sv—seminal vesicle
ex—excretory tubule	ts—testis
gp—genital pore	ut—uterus
mt—metraterm	vt—vitellaria